

Compressed Air Systems

When do the Standards Apply?

The **2016 Building Energy Efficiency Standards** (Energy Code) has requirements for all new compressed air systems and for all additions and alterations to compressed air systems where the total combined online horsepower (hp) of the compressor(s) is 25 hp or more. Online horsepower does not include backup compressors.

The Energy Code defines a compressed air system as a system of at least one compressor providing compressed air at 40 psig or higher.

The requirements are mandatory and apply to the primary storage, compressors, and related controls. They do not apply to any equipment or controls that use or process the compressed air, or secondary storage tanks near the end use devices.

Alterations of existing compressor systems that include one or more centrifugal compressors are exempt from these requirements.

Requirements for compressed air systems can be found in **Title 24, Part 6, section 120.6(e)**.

What Is Covered?

Controls

Compressed air systems with more than one compressor online having a combined hp rating of more than 100 must operate with a controller that is able to choose the most energy efficient combination of compressors within the system based on the current air demand as measured by a sensor.

Compressed Air System Acceptance

Before an occupancy permit is granted for a compressed air system subject to section 120.6(e), the system must be certified as specified by Reference Nonresidential Appendix NA7. A Certificate of Acceptance must be submitted to the enforcement agency that certifies the equipment and systems meet the acceptance requirements specified in Reference Nonresidential Appendix NA7.13.

Trim Compressor(s) and Storage

The compressed air system must be equipped with a trim compressor(s) and primary storage to provide acceptable performance across the range of the system and to avoid control gaps. The trim compressor(s) and primary storage must comply with one of two options:

- Option 1 includes one or more variable speed drive (VSD) compressors. Systems using VSD compressors must meet the following:
 - For systems with more than one compressor, the total combined capacity of the VSD compressor(s) acting as trim compressor(s) must be at least 1.25 times the largest net capacity increment between combinations of compressors.
 - The compressed air system must include primary storage of at least one gallon per actual cubic feet per minute (acfm) of the largest trim compressor.
- Option 2 does not require a VSD compressor:
 - The compressed air system must include a compressor or set of compressors with a total effective trim capacity no less than the largest net capacity increment between combinations of compressors, or the size of the smallest compressor, whichever is larger. **Figure 1** illustrates how to calculate the largest net capacity increment in a three-compressor system.

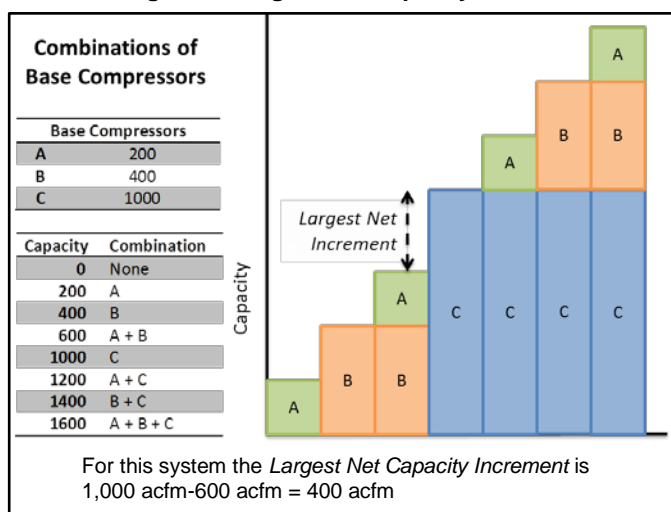
- The effective trim capacity of single compressor systems must cover at least the range from 70 to 100 percent of the rated capacity. The effective trim capacity is the size of the continuous operational range where the specific power of the compressor (kW/100 acfm) is within 15 percent of the specific power at its most efficient operating point. The total effective trim capacity of the system is the sum of the effective trim capacity of the trim compressors. **Figure 2** illustrates how to calculate the effective trim capacity of a compressor using the manufacturer's power curve data.

- The system must include primary storage of at least 2 gallons per acfm of the largest trim compressor.

There are two exceptions to these trim and storage requirements:

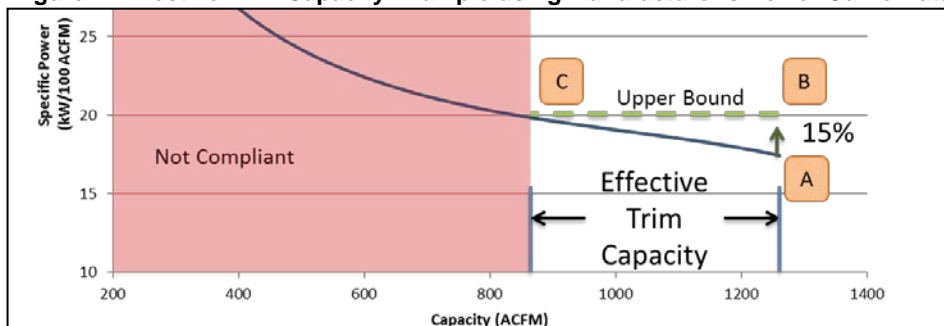
- Compressed air systems in existing facilities that are adding or replacing less than 50 percent of the online capacity of the system
- Systems that have been approved by the Energy Commission that serve loads where typical air demand fluctuates less than 10 percent

Figure 1: Largest Net Capacity Increment



Source: 2016 Nonresidential Compliance Manual

Figure 2: Effective Trim Capacity Example using Manufacturer's Power Curve Data



Source: 2016 Nonresidential Compliance Manual

The minimum specific power (labeled **A**) occurs at 1,261 acfm, with a specific power of 17.4 kW/100 acfm. Using this minimum specific power, the upper bound is $17.4 \times 1.15 = 20.01$ kW/100acfm or 15% higher. The effective trim capacity is between 1261 acfm (labeled **B**) and 845 acfm (labeled **C**), resulting in an effective trim capacity of $1261-845 = 416$ acfm.

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